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## ELECTRONIC COMMUNICATIONS:

Computer Conferencing
Computer Networks
Interactive Cable

Title

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# ELECTRONIC COMMUNICATIONS:

## Computer Conferencing
## Computer Networks
## Interactive Cable

By Jonn Ord

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# INTRODUCTION

The past three decades have seen a steady growth in a process that some have predicted will have an explosive impact on society within the next several years. This process, the gradual transformation of various methods of communication into digital, machine-readable form, may be thought of as the computerization of communications (Wilson, 1984). A recent report suggests that the resulting electronic services industry, with information as its sole commodity, may be destined to become a 100 billion dollar industry by 1995 (Gaffner, 1985).

The different processes used to manipulate and transport digital information produce a sometimes confusing array of services. Electronic mail services, electronic bulletin boards, computer conferencing systems, and the various computer databases all operate with the same commodity of digital information, but they may organize and present the same material in different ways. As an example, a paragraph of text might be generated on a home computer and then be sent as an electronic mail message, posted on an electronic bulletin board, entered in a computer conference, or stored as a news item on a public access database. In each case this same unit of information is conveyed by some type of communication system--whether the public telephone service, a coaxial cable system, or a satellite delivery service--and then manipulated and stored at a remote location. The software that controls this storage and manipulation allows the original text to be recalled and presented in the way that users of that particular system expect to find it.

Of the above-mentioned processes, computer conferencing systems have the greatest ability to enhance educational communications. A computer conferencing system generally incorporates such features as an electronic mail system, the ability to download software, and, most important for education, a system to support computer-based communications among groups with shared interests.

This report begins by describing the major features of electronic mail, bulletin boards, and computer conferencing. As the main focus is computer conferencing, several systems and their applications in education are then presented. The potential of computer conferencing for enhancing TVOntario's educational systems and services, as well as administration

and communications, is then explored. Particular attention is paid to CoSy, the system developed and operated at the University of Guelph. The major recommendation is that pilot projects be developed using CoSy to investigate and evaluate the applicability of computer conferencing to TVO educational programming and services.

In addition, information gathered in the course of this investigation concerning computer networks and interactive cable systems is included in the appendices.

## Related Systems

More established than computer conferencing are the electronic bulletin board and electronic mail. The following descriptions highlight the similarities and differences of these systems.

The Electronic Bulletin Board. An electronic bulletin board--such as the one recently set up by TVOntario's Adult Programming in connection with Money$worth--allows a user to sign on to a central computer, often a small micro such as an Apple II or an IBM PC, and read or leave messages in a common display area. Text or software is often stored on the system and may be downloaded to the distant user, or uploaded from a remote source and stored on the bulletin board for general access. While such systems can usually receive only one call at a time and provide limited interactivity, they are relatively easy to run and maintain. A host of enthusiastic computer operators across the country have microcomputers dedicated to providing local electronic meeting places for those with common interests.

Typically, each bulletin board has a particular topic or focus, such as games, a brand of computer, a hobby, or business interest. Sometimes access is free to anyone and sometimes a password or membership fee is required.

Electronic Mail. Electronic mail is a system for the delivery of readable information, in digital form, between a sender and one or many receivers; usually this information is stored and processed by a central computer. The electronic bulletin board facilitates general distribution of information to all those with access to the system. In contrast, electronic mail is designed for personal communication, targeted by the sender to selected recipients.

## Features of Computer Conferencing

> "A computer conferencing system uses the computer to structure, store and process written communications among a group of persons. When something is entered through one terminal, it may be obtained on the recipients' terminals immediately, or at any time in the future until it is purged from the computer's memory. Just as it would be difficult to explain to someone who has never observed or participated in a face-to-face discussion or decision-making group the communications processes and social dynamics involved, so the best way to learn about computerized conferencing is to participate." (Hiltz and Turoff, 1978)

Like electronic bulletin boards and electronic mail, computer conferencing systems allow users to exchange ideas and information on particular subjects. However, one of the most useful and distinctive characteristics of computer conferencing systems is their ability to organize and manage large amounts of information (Figure 1). Messages are filed under a discussion topic that is usually a sub-heading of the

Figure 1

general conference title. (For example, a conference on music might have topics of classical, folk, and pop.) As a participant reads messages in a topic, the conference system moves a pointer to keep track of which messages have been read, so that only unread messages are announced at the next sign-on (Figure 1). Previously read messages can also be displayed, so that the complete record of a computer conference is available at any time. The software also allows responses to be linked to the initial message, e.g., "this is a comment to message #339."

As a comparison, the electronic bulletin board may be seen as a single conference topic which must deal with all subjects under the same category. The bulletin board often does not link related messages together, or use a pointer system to eliminate rereading old messages. Also, a bulletin board system running on a microcomputer can only accommodate one caller at a time, whereas a conferencing system running on a VAX or other mini can accommodate many users at once, and the computer continues to perform other tasks at the same time. A conference is not held at a particular time--since the conference itself is "asynchronous"--so participation is at the convenience of the individual rather than the group (Figure 2).

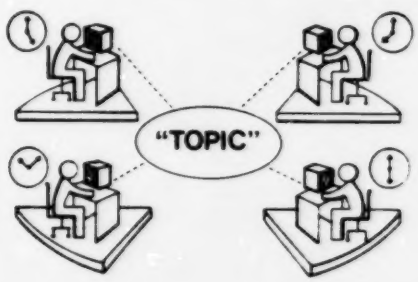


Figure 2

Users may engage in private exchanges or "whispered conversations" at any time by using the electronic mail facility to communicate with a particular person or persons. Where a computer conference user contributes a message to a conference topic to which all members have access (Figure 2), an electronic mail message is sent only to selected recipients.

Computer conferences may be open, closed, or confidential. In an open conference, any system user can participate; in a closed conference, membership privilege must be requested of the conference moderator; in a confidential conference, membership is restricted and even the conference title will not appear among the list of conferences. Conference members may withdraw from any conference at any time.

## Some Observations

According to Jacob Palme, developer of the Swedish conferencing system called COM, computer conferencing has many advantages over the electronic bulletin board or straightforward electronic mail. Palme notes that all good conferencing systems are also good electronic mail systems. Experience indicates that in most cases where a large volume of two-way communication is anticipated, it is more time- and cost-efficient in the long term to start directly with a conferencing system, rather than initiating a mailing system or bulletin board that would soon become cumbersome and overloaded. Other expert observations include:

- The computer conference has wide boundaries for location, culture, age, time, and numbers.

- As a computer conference can bring together a diverse assembly of perspectives and opinions, it is suggested that individual participants may experience a significant shift in position.

- A well-written manual with specific examples of important key-stroke sequences is essential, along with well-designed "user friendly" software.

- Hiltz and Turoff (1978) suggest that a minimum of between 8-12 active participants located in at least three locations are required to form a so-called "critical mass." Above this size and distribution, enough activity is generated to motivate users to sign on regularly and participate in exchanges. A conference of 30 to 100 (some say 300) participants can also work well.

## CONFERENCING SYSTEMS

Numerous computer conferencing systems have been developed in the United States and Canada, and a growing number of institutions are introducing computer conferencing both as a communication link in distance education courses and as a course enhancement for local students. The following is a description of some of the better known systems and their educational applications.

### EMISARI and EIES

Computer conferencing originated in Washington, D.C. in the late 1960s at the Office of Emergency Preparedness (OEP) when the Executive Office of the President created the Systems Evaluation Division to conduct operations research. This resulted in the first computer conferencing software, developed by Murray Turoff, called EMISARI (Emergency Management Information and Reference Index). EMISARI provided communication between 10 regional offices of the OEP, as well as access to a central store of tables, reports, and other information. In the face of considerable skepticism and opposition, EMISARI proved to be a "novel, effective, and interactive management information system."

The next generation of the conferencing software was called EIES (Electronic Information Exchange System--pronounced "eyes") and was developed by Turoff at the New Jersey Institute of Technology in 1976. The EIES conferencing system has since become a well-established working tool for scientific research and course enhancement at the New Jersey Institute of Technology and has inspired the development of computer conferencing as a new mode of communications in several countries including Sweden, England, the United States, and Canada.

In spite of its pioneering role in the development of computer conferencing, the EIES system has not been widely adopted in different locations, largely because of its lack of portability as it runs only on a Perkin-Elmer 3000 series computer. By 1987, there will be a version in "C" language for the UNIX operating system. Individual membership to EIES costs $75 U.S. per month, and a group may sign up for $200 U.S. per month plus $10 per month for each individual member.

Connect charges are not included and are likely to be between $3 and $8 per month.

## PARTICIPATE

PARTICIPATE, or PARTI, was developed by Participation Systems Inc. in Winchester, Massachusetts. It is available for the DEC VAX, Prime 50, Honeywell DPS-6, IBM mainframe running VM, and computers running UNIX 5. PARTI is being promoted for private sector use and is currently licenced to The Source, Reader's Digest's online information utility and ITT's database, Dialcom. PARTI will be used in an upcoming project at KUON-TV, funded by the Corporation for Public Broadcasting, to study the potentials of computer conferencing (see page 15 for further details). The PARTICIPATE conferencing software is available for purchase for $15,000 U.S.

The University of Wisconsin and the Electronic Text Consortium offered a television-based, three-credit course called "Congress: We the People." The course was offered throughout Wisconsin to distance learners who were able to communicate with their instructor, with each other, and with several participating U.S. Members of Congress by means of the PARTICIPATE conferencing system. According to Brenda Phaehler at the University of Wisconsin, response to the course was enthusiastic. Coordinators are currently investigating gender-based differences in uses of and responses to the system.

The American Open University (AOU) at the New York Institute of Technology has been using computer conferencing in conjuction with its courses for two years. The AOU offers degrees in business, behavioural science, and general studies, and students can begin a course at their own convenience. While all the University's courses are print-based and self-contained, it is highly recommended that students take advantage of the conferencing facility to communicate with each other and with the course "mentor." According to Director Chris Languth, results indicate that the improved communication leads to greater satisfaction and better performance by the students. The initial experiments were done using an electronic mail system, which proved to be inadequate. The conferencing system selected to replace it was PARTICIPATE.

## COM

Although this conferencing system was developed in Sweden, COM is well known in Europe and North America, largely because of its designer, Jacobe Palme. The University of Stockholm in Sweden has two versions of COM running, one in Swedish and one in English. The Swedish language version has about 1,100 users with about 400 active conferences, while the English-language system has about 400 active users from more than 10 countries on three continents. PORTACOM, a more portable version of COM, was developed with financing from nine European countries. COM and PORTACOM systems are installed on about 20 computer sites in Europe and North America. Costs for the COM or PORTACOM systems, for a maximum of eight ports, are given below.

| | University | Other Users |
|---|---|---|
| Perpetual license | $9,000 | $18,000 |
| Maintenance per year on perpetual license | $1,450 | $2,890 |
| Leasing fee per year including maintenance | $3,250 | $6,500 |

A system with more than 16 ports costs twice the above.

The Open University in the United Kingdom is preparing to introduce computer conferencing as an enhancement to their courses, starting in 1986. They are considering use of the COM or PORTACOM systems. According to Dr. Tony Bates, Open University instructors hope to increase the role of conferencing in their course delivery, especially in those courses that are subject to frequent changes.

## CONFER

This conferencing software was written by Robert Parnes, a Canadian at the University of Michigan, and is running at the University of British Columbia and the University of Alberta, as well as at Michigan. CONFER is a sophisticated package

with over 200 pages of documentation, but the manuals are difficult to follow. In addition, the system is not portable, since it runs only on an IBM or Amdahl mainframe computer using the MTS operating system. Billing for this service is broken into three categories: computer time, DATAPAC charges, and royalties to Parnes for use of the program. Computer charges vary with time of day and type of client, but a typical user would probably pay about $10 per hour. To lease or purchase these particular computers, the operating system, and negotiate rights to the software would probably require a capital outlay of $4-10 million and about $500,000 a year in maintenance.

## STAR FORUM

This conferencing software was written at the University of British Columbia by Allan Ballard and is also maintained at the University of Alberta. Like CONFER, this system is designed primarily for internal university use and is not particularly "user friendly." It is also machine dependent on an IBM or Amdahl mainframe computer with the MTS operating system, making it an unlikely candidate for widespread use. It is a little cheaper to use than CONFER because Ballard does not add a royalty charge so costs are only for DATAPAC and computer time.

## CoSy

Computer conferencing software, called CoSy (COnference SYstem), has been developed at the University of Guelph. Fully operational since 1983, the system was able to build on the experiences of the EIES and COM systems. CoSy now has over 100 conferences with more than 900 participants from around the world. It is written in "C" language and runs under the UNIX operating system, which makes it relatively portable. The CoSy system has recently demonstrated the successful transmission of a NAPLPS file, both within a conference and through its electronic mail subsystem. CoSy is also able to reproduce French accents, even at terminals that do not produce accents directly. Finally, CoSy has the important ability to download and upload software to and from its users.

This facility is of particular importance to BYTE magazine in Massachusetts which has elected to purchase and use the CoSy software in a new venture to make computer conferencing available to its regular subscribers. A main feature of this new service will be a large catalog of available software from which users can select and then download a particular program from the system. BYTE representatives have selected CoSy in preference to the PARTICIPATE software mentioned earlier.

The University of Guelph has used the CoSy conferencing system in conjuction with a number of courses, mostly as a seminar tool at the graduate level. Users were full-time or part-time students in the University's Adult Education program. A study involving these students examined some of the advantages and disadvantages of using computer conferencing in a learning environment. The study group, almost without exception, became comfortable using the system and found CoSy to be a useful educational tool. The conclusions to the report note that computer conferencing is aimed primarily at an adult market and that adult learning is a voluntary process. It is particularly important, therefore, to create a positive learning experience for new conferencing candidates by means of such things as ready access to computer terminals and a well-organized professional introductory seminar. The report outlining this trial is available in the Office of Development Research.

Guelph has planned a series of noncredit courses using CoSy for Fall 1985. The first one is on the modern spy novel; others will cover computers in small business, management accounting, and English literature. Future initiatives include credit courses using CoSy for discussion and support.

## TVONTARIO AND COMPUTER CONFERENCING

TVOntario has recently begun to use computer-based communication systems by introducing the Money$worth bulletin board system for distributing program transcripts and related documents. A computer conferencing system could further enhance TVOntario's communication abilities by providing electronic links among learners, by extending the capacity to transmit learning materials, and by supporting computer-based communication among educators, researchers, managers, and government officials.

### Educational Uses

The Office of Development Research obtained access to the University of Guelph system, CoSy, in January 1985 for a complimentary trial period, providing an opportunity to evaluate the system with some "hands on" experience and to investigate possible uses of a conferencing system for the organization. During the trial period, about 20 TVO people visited ODR for individual demonstrations and, in some cases, requested personal passwords for further exploration of the system. As a result, several suggestions have been made for possible uses of computer conferencing at TVO.

- The Telematics department conducted a preliminary field trial using CoSy in June 1985. The purpose of the trial was to assess the usefulness of computer conferencing in facilitating communication among selected representatives from the Eastern Regional Area School Boards and Ontario Educational Software Service coordinators at TVOntario. This trial attempted to use CoSy to download text to the test sites. The Office of Project Research is conducting an exploratory study of the trial to help Telematics assess the potential and usefulness of CoSy. Based on a positive response to the potentials of computer conferencing in this short field trial, Telematics will begin a longer trial in the fall to include other regions of Ontario. The use of ICONs with CoSy will be explored, as well as the use or development of communications software for various microcomputers.

- Staff in the French Educational Services have suggested that computer conferencing could be used for three projects as described below:

  OCTO-GICIEL, the follow-up Academy to Octo-puce, will begin in September 1985. It is aimed at an audience that is already familiar with microcomputers, and computer conferencing would be an appropriate development from the limited bulletin board system used in the original series.

  COMMUNICATEURS-CLÉS are the television resource teachers in French schools. Since the great majority of the schools have computers, it would be an exciting project to set up an on-going conference for key communicators.

  CENTRES CULTURELS: There are 15 major francophone cultural centers in Ontario. With sufficient resources, an on-going dialogue with these centers would be very useful.

- The Research Officer for the recent TVOntario Forum on Creativity has suggested the use of computer conferencing as an adjunct to the next Forum being planned in Adult Programming for 1985/86. A major factor in considering the suitability of this service for the Forum would be the costs to the participants.

- Staff in the Part-Time Learning Branch have suggested the following possible applications for computer conferencing:

  - TVO could "host" a conference for the TVO/COU (Council of Ontario Universities) Distance Education Committee. Conference topics would include strategic objectives, plans for cooperation, and enrolment targets. Core content of the conferences would include plans, strategies, and proposed activities, as well as a record of successes, failures, and problems.

  - By incorporating a computer conferencing option into PTL programs, participants would be able to "talk" to each other thereby expanding the opportunities for contact currently offered through organized activities, newsletters, and telephone lists.

- The ability of a conference moderator to interact with participants would provide an alternative form of feedback.

- Delivery of TVO's videotex databases to microcomputers with NAPLPS decoders and color boards.

- Electronic delivery of software to schools.

- Electronic delivery of transcripts, question sheets, and other materials supplementary to television programs, e.g., Money$worth.

- Use as a tool for the distance learner to communicate with instructors and other students, and to access databases and materials provided by the instructor.

- An interactive electronic newsletter, perhaps for TRTs, Academy support, or other purposes. This would be similar to a conference but could allow prior electronic submission of articles to a restricted-access conference for editorial evaluation, editing, or integration with other articles.

Communication Uses

- Communication with broadcasters and educators in other provinces.

- Joint research projects with researchers in Canada and abroad.

- Means of collaboration with other educational institutions for developing program materials.

- Provision of direct feedback to TVO on needs, opinions, and orders for materials.

- Registration of requests for print and video materials.

- Communication with federal and provincial ministries and departments.

- Negotiations on scripts, contracts, funding, etc.

- Internal electronic mail facility.

- On-going conferences (closed) on various management and policy issues.

- Access to on-going conferences and electronic mail by TVO personnel travelling throughout North America and Europe.

- There are several educational networks in Canada as well as commercial enterprises in the United States that are seriously considering or have purchased the CoSy conferencing system. Specifically, these are the Council of Ontario Universities, the Social Sciences and Humanities Research Council of Canada, the Canadian Higher Education Research Network, the Ontario Institute for Studies in Education, as well as BYTE Magazine publisher McGraw-Hill in the United States. Should these organizations elect to adopt the same software for conferencing and electronic mail as TVOntario, there could be advantages in breadth of communication and sharing of ideas and resources.

- The Corporation for Public Broadcasting has set aside $75,000 for an eight-month project to investigate the potentials of computer conferencing and other electronic communications systems. Over 50 public television and radio licensees, as well as a variety of regional and national organizations have been invited to participate in a minimum of 15 computer conferences, on topics ranging from traditional broadcasting issues such as administration and audience research to new technology concerns such as interactive videodiscs, electronic text, data delivery, and satellites.

  An invitation has been extended to TVO to participate in this research through Scott Leigh, Computer Conferencing Systems Manager at KUON-TV, University of Nebraska-Lincoln. The conferencing software for this trial is PARTICIPATE, described earlier. Although this would not provide direct experience with CoSy, participation in this project would provide valuable information about current educational applications and developments of various technologies in the United States. It could also encourage TVOntario and the CPB to share relevant ideas and perspectives on computer conferencing.

## Costs

For the present trial, Telematics is renting access to CoSy from the University of Guelph. At the current group rate, the costs are:

- $10 a month per user I.D. Locations may have more than one registered user, each requiring a different I.D. For the Telematics trial, there were five TVO users plus at least one in each of the selected school boards.

- $3 per hour for use of CoSy, with a minimum charge of three hours or $9 a month.

- $7 per hour for DATAPAC, based on actual time on the system.

For future projects, TVO could continue to rent access to CoSy through Guelph. Users throughout Ontario would have to dial into DATAPAC and incur the $7 per hour charge, plus any long distance charges to connect to the nearest DATAPAC node. For three hours of CoSy a month, the user would therefore pay $40, plus long distance charges. At present, Bell Canada and the CRTC are considering the implications of a nationally available 800 number connection to DATAPAC. This could provide easy access to any TVOntario database, including a conferencing system (see page 29).

A second alternative would be to purchase the CoSy software for TVO use. Based on the TVOntario educational mandate, the CoSy Advisory Board has created the category of "Supported Educational Licensees." As a member of this group, TVO could purchase CoSy for $7,500, plus an annual maintenance fee of $2,500. (This would be for a 16-port system which allows 16 simultaneous calls.) TVOntario could then set rates for users or adopt those of the University of Guelph, as outlined above. In this case, the Guelph system operators would be at hand to facilitate the software installation and to provide maintenance and operating instructions, and TVO would be given access to the CoSy system at Guelph to facilitate communication and cooperation in the future.

It is the desire of the CoSy development team at Guelph to utilize the research and development potential of each working site so that worthwhile innovations at each location may be implemented on periodic upgrades to the system. They plan to add the capacity for a distributed conference that allows the same conference to be run on separate systems in

different locations; the systems are automatically linked so that a user at any terminal sees only one conference, with participants making contributions from all linked systems. An example of a useful distributed conference on the operational level would be one that deals with system problems, or with new innovations and ideas.

There is some possibility of revenue generation through TVO ownership of CoSy. Interest has been expressed by several outside organizations that are unable to run a conferencing system individually, but would be interested in subscribing to a group membership through a host organization such as TVO. Such organizations could be billed at a group rate as described previously. Some examples are:

- The federally and provincially funded Arts Community Network. This group has 14 members with micros and no way of communicating. Contact coordinator: Tim Leary at Equity Showcase, 960-1813.

- The Amazon Line. A commercial computer network for women, this group would like to use computer conferencing. Contact: Linda Ryan Nye, 461-5620.

- The Canadian Electro-acoustic Collective. A proposed network of composers organized by Kevin Austin at Loyola University in Montreal, this group would also like to distribute an electronic newsletter and attempt to download (MIDI) music files over a conferencing system. Telephone: (514) 484-5687.

- The Co-operative Housing Federation of Canada. This is a national organization (with 75-member sites in Toronto alone) that would like to establish computer-based communications. Contact: Gary Levine, 863-6247.

## RECOMMENDATIONS

The CoSy computer conferencing system can provide increased opportunities for learner exchange, store and sort large amounts of information, and download both computer software and NAPLPS files. The potential applications listed in the previous section are only examples of the educational support and information exchange that CoSy could facilitate. By implementing CoSy projects, TVO could enhance its present learning opportunities and program offerings, as well as play an important role in developing conferencing applications in education.

It was through ODR's work with computer conferencing that Telematics became familiar with and began to work with CoSy. The Telematics preliminary field trial and the decision to begin a wider application in the fall are, in fact, an operationalization of ODR research. However, the recommendation from this study is that other applications for CoSy also be considered. CoSy projects could be designed to support programming from the Market Groups, utilization projects, Telematics services, or general organizational communications. The important factors would be to have well-planned and well-coordinated projects that would be carefully monitored for their effectiveness in reaching and serving the target groups. To implement and maintain these initial applications would require cooperation from a number of departments such as Telematics, MIS, the Market Groups, and the Research departments, and would best be realized by appointing a dedicated conferencing coordinator. There are a number of policy, technical, and educational issues that would require attention. A few of these are:

- Establishment from the outset of a policy of critical evaluation of the conferencing process as a learning medium, with particular attention to the types of interaction, and the forms of information manipulation by the user that are most conducive to learning.

- Establishment of a written record of the progress and development of the new system, perhaps in the form of a conference.

- Development of optimum methods for preparing and inputting materials, initiating, participating in, and moderating conferences.

- The coordination of policy development with regard to membership, password assignment, access levels, and general security.

- Investigation of the ways of using French accents from different terminals.

- Participation in useful and relevant projects at other locations, such as the CPB study at KUON-TV beginning this summer.

- Potential development of communication software that would perform sequences for log-on, print, and download more simply than the current system.

- The purchase or continued rental of the CoSy software. If the decision were made to purchase, the following issues would also require consideration.

  - Priority assignments and system modification, if any, that would be required in order to mount the software on the VAX.

  - Instruction and documentation from the Guelph team on the operation, maintenance, and requirements of the system.

  - The possible customizing and redesigning of CoSy entry and log-on procedures in an appropriate fashion for TVOntario users.

Working with CoSy would be a challenge for TVOntario to increase our learner services and our communication capacities. Pilot projects would allow the assessment of the contribution that CoSy could make and the developmental and maintenance costs of using computer conferencing.

It is recommended that the initial projects be developed with groups such as school board computer coordinators, communicateurs-clés, or the Council of Ontario University Distance Education Committee. These projects would have potential for external funding and would build on existing shared interests. The costs--at $40 a month for three hours use--and the unfamiliarity of the system and the content would make it less feasible for immediate use with individual learners. If the experience were seen as successful, then a more formal conferencing facility could be established as a continuing enhancement to TVO services.

## CAVEAT AND CONCLUSIONS

In spite of the exciting possibilities for this medium, there is a clear need to acquire more experience in the processes of human interaction with this technology. A new participant observing important information passing in front of his or her eyes on a monitor will not necessarily retain that information, and a learning process will not necessarily occur. In fact, the rapid and somewhat passive skimming style often used to read messages can have the opposite effect of reducing the significance of the text to the reader. This can lower the tendency to reflect carefully on what is written, with the end result of a reduction in the overall value of the information communicated (Hiltz and Turoff, 1978).

Computer conferencing systems are designed by computer scientists rather than educators, and computer conferencing seems to work particularly well in research and communication situations in which the participants are all relative experts in the subject field and are working toward a common goal. In such situations, the subject material is very familiar and has already been greatly personalized by the participants so that they are able to relate to new material within this field with a large array of customized responses.

The beginning student has fewer of these associations from which to draw. The way that electronic information is typically presented in this medium--as an endless supply of unformatted text that flashes past on a monochrome screen--leaves little opportunity for the student to interact with the material and to manipulate it in some unique and meaningful way. Such an interactive procedure is vital in order to transfer information into long term memory and to capture its meaning in a personal context that can be recalled and reused at will. However, this process is even less likely to occur when the student has never been informed that such a personalizing procedure is a necessary part of this learning activity.

Because of the lack of voice intonations and nonverbal cues to distinguish between common moods such as humor, sarcasm, and irritation, there are some unexpected social and psychological implications of the use of language in this medium to be examined, as well as a need to develop efficient

and helpful ways to convey this important information to the new user.

While use of computer conferencing as an educational tool is currently attracting considerable interest, it is still a process in its infancy. Technology is now developing to the point where conferencing systems could incorporate color displays, screen formatting and editing, NAPLPS graphics, and the ability to save to disk or dump to a printer; there is a great need for research on the importance of these devices and on ways to optimize their use as aids to learning. With experience in the areas of educational telecommunications, research and development of learning materials, as well as in-house computer expertise, TVOntario is in a good position to begin a program of development and evaluation of the potentials of computer conferencing. Such a program would involve a relatively small initial cost and could provide the possibility of opening up significant new areas and directions of development.

In the early stages, it is likely that a minority of TVO viewers will have the equipment necessary to participate in computer conferencing. However, it has been suggested that the market for electronic delivery of educational materials will be greatly augmented in the years to come (Lane, 1985). Meanwhile, recent enthusiastic response to the electronic bulletin board created for Money$worth gives some indication of the market for such interactive systems, even at the present time.

Immediate uses for computer conferencing would be found with interactive group communications, program enhancement, software delivery, and discussion, as well as the electronic mail service. If, as suggested, computer conferencing projects are initiated at TVOntario, a mechanism should be set in place at the outset for the study and guidance of the system with a concern for educational process and value. It is hoped that computer conferencing will result in new avenues for personal, satisfying exchanges that promote real learning.

## APPENDICES

During this research on electronic communications, computer networks, interactive cable, and computer conferencing were studied. The recommendations of the report focus on computer conferencing and CoSy. However, it was felt that some of the information on the other topics would be valuable. Consequently, the detailed coverage of networks and cable is included in the appendices to serve as a reference source on these aspects of electronic communications.

**APPENDIX A:** Computer Networks

- Local Area Networks
- Packet Switching Networks
- Wide Area Networks
  - ARPANET
  - CSNET
  - UUCP
  - BITNET
  - MAILNET
- Networks in Canada
  - MLNET
  - iNET
  - ENVOY 100
  - NETNORTH
  - CDNNET
- Educational Use of Canadian Networks
- The Future

**APPENDIX B:** Interactive Cable

- Introduction
- Interactive Cable in Canada
  - Rogers
  - Videotron
- The Future

## APPENDIX A: COMPUTER NETWORKS

A computer communications network is a system of microcomputers, terminals, and communicating word processors that are linked via telephone lines, coaxial cables or satellite systems usually through a central computer. A network configured in this way is a "star" network. There are also some networks that do not depend on a central computer, in which sites may pass information among several computers having identical software. People use networks to move information as well as to utilize the features provided by the networks.

It is useful to distinguish between the network itself, which may be thought of as a road map of the system describing the available connections, and the special features of the network, which are a function of the hosting software. This hosting software, usually located on the central computer, is immediately available to the user who signs on to the network. Thus the "network"--or more accurately, the central computer of that network--may provide a simple electronic mail system or it may offer a more complex service, which may look like an electronic bulletin board or even a computer conferencing system. Different networks may be connected together via designated "gateways." A comparison may be made with an airline network which transports people rather than data. The layout of the basic airline network is usually described by a map on the wall showing the locations to which the network provides access. A customer using a particular airline service may end up sitting in a small uncomfortable seat listening to engine noise, or on a different airline, may eat an appetizing meal followed by an in-flight movie. The airline may be connected through a particular terminal (gateway) to a subway or bus network with different characteristics and benefits. In these examples, the actual networks would be defined by the air routes, the subway tracks, or the roads that the bus travels. The airline, train, and bus companies with their various customer services and benefits would correspond to the host computer of the network along with its characteristic software which provide the benefits of the system.

Computer networks can be classified as local area networks, packet switching networks, or wide area networks.

## The Local Area Network

The main purpose of the Local Area Network (LAN) is to share the resources of a number of computers or terminals that are fairly close together in order to reduce costs and minimize redundant equipment. Typically, one computer in the LAN is particularly well-equipped with, for example, a hard disk for storage, a printer, and perhaps a modem, while the other computers or terminals are wired together to allow them all to share access to these devices. The connecting wires are usually coaxial or biaxial-shielded cable to allow for very rapid transfer of information within the network. LANs are further described, according to the way the stations are wired together, as being a star network, a ring network, or a bus system.

When a Local Area Network is connected to a Wide Area Network, the whole LAN may act as a single user with a single address on the larger network, while still allowing access by many individuals. As a comparison, a Wide Area Network, such as an airline, may deal directly with each customer or it may deal with a club as a single entity, which itself offers charter flights, i.e., use of the large network, to its own network of members. Some examples of better known LANs are Radio Shack's Arcnet (Attached Resource Computer Network), the Cambridge Ring developed in the U.K., and Ethernet, by Xerox. There are many other LAN systems available, but since there are as yet no universal standards for LANs, they are usually not compatible with each other.

## Packet Switching Networks

In order to send digital information efficiently over long distances without tying up expensive telephone lines, a system called packet switching was devised, allowing many users to share the same channel. Where the ordinary telephone connection maintains an exclusive channel between users, the packet network accumulates data into "packets" and then transmits them at high speeds on a common network to an encoded address. There is an analogy in the everyday world with the way that busloads of people share the same highway with many other vehicles, all with different origins and destinations.

Although packet switching networks are more complex and expensive to install and maintain than regular phone lines, they are cheaper, more flexible, and more reliable to use.

In Canada, the main packet switching networks are DATAPAC, operated by the Trans Canada Telephone System, and INFOPAC, operated by CNCP.

As there is no permanent connection maintained on these systems between specific users during their communication, charges are based mainly on the amount of information sent, measured in kilopacs rather than on connect time or distance. The kilopac, which is a thousand packets, may be thought of as about 3,000 lines of data or the equivalent of 50 typewritten pages (a single packet contains 256 characters). An organization requiring regular access to DATAPAC may pay a monthly fee, called the access charge, for dedicated connection lines running directly into the network.[1]

Less frequent users of DATAPAC may dial into the network through one of the public dial ports which are located in most major Canadian cities. [2]

If a particular use is anticipated for an area without a local access number, it is also possible to lease, on a monthly basis, a direct line that would have a local telephone number and connect directly to the closest DATAPAC node.

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1. There are two types of dedicated lines with different rate structures. If the equipment used is compatible with the international X.25 standards, then a DATAPAC 3000 line is used. The cost of this is between $150 and $434 per month correponding to a baud rate between 1200 and 9600. Equipment that is not X.25 compatible uses a DATAPAC 3101 connection, which costs $78 or $134 per month for 300 or 1200 baud use. Added to these access charges is the data charge of between $.45 and $1.70 per kilopac, depending mainly on the frequency of use of the route.

2. Access to a public dial port requires use of a modem operating at either 300 or 1200 baud, and the cost incurred in this case is $.45 per kilopac plus a charge of $.03 per minute of connect time. Since anyone may use DATAPAC in this way, calls made through a public dial port become "collect" calls and these relatively low charges are billed to the host institution. Bell Canada reports that public dial ports are being added to more Canadian cities as demand for DATAPAC increases.

If the customer is located outside the area of these public dial ports, then long distance charges are incurred from the source to the closest public port. The later section on ENVOY 100 discusses the possibility of national access to DATAPAC using an 800 number.

Direct connections are now in place from DATAPAC to TYMNET and GTE TELENET in the continental U.S. and DASNET in Hawaii. Through Teleglobe Canada, DATAPAC users can reach packet networks in Austria, Belgium, Denmark, Finland, France, French Antilles, West Germany, Greece, Hong Kong, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Singapore, South Africa, Spain, Sweden, Switzerland, and the United Kingdom.

## Wide Area Networks

Wide Area Networks provide links between computers over much larger distances than Local Area Networks, therefore, they are more frequently used for international communications.

ARPANET. One of the first computer networks covering large distances was developed by the Advanced Research Projects Agency of the U.S. Department of Defense in 1969. Called ARPANET, this network has grown to well over 100 computers worldwide, connected by satellite channels and high-speed leased lines. A main use for ARPANET is message exchange between individuals separated by thousands of miles, who share the same research or teaching interests.

CSNET. The Computer Science NETwork is sponsored by the U.S. Government. It links different locations using several network facilities, including ARPANET and TELENET. Membership is aimed at computer science or research departments and costs $5,000 per site, not including communication charges. Its objective is to share information and research.

UUCP. Unix to Unix Communication Protocol (UUCP) is an example of a network dedicated to a specific operating system. The widespread use of the UNIX operating system includes a growing segment of the educational community. There are now over 1,600 sites for this network including organizations in many parts of the world. However, because

of technical structures, message delivery can be unreliable and can take several days, or even more for intercontinental mail.

Most users of UUCP participate in USENET, a Unix news facility that provides a sophisticated messaging service with on-going discussions under different headings such as NET.bicycle, NET.religion, CAN.AI (Artificial Intelligence), CAN.politics, ONT.micro, ONT.singles, ONT.jobs.

BITNET. The Because It's Time NETwork is another systems-based network, in this case built around the IBM VM/CMS machines and designed for interuniversity communications and research. The network, initiated in 1981 by Yale University and the City University of New York, is open to all degree-granting colleges and universities, and qualifying government and industrial laboratories. BITNET now serves about 168 institutions with over 400 connected computers. There are gateways from BITNET to several other networks such as ARPANET, MAILNET, NETNORTH in Canada and EARN (European Academic Research Network) in Europe. It is paid for by the users who lease the lines that run to their nearest neighbor(s) and agree to handle through traffic without additional charge. The lines will support communication at 9600 baud and allow access to BITSERVE, the BITNET server machine that provides more information and services relevant to the users.

MAILNET. MAILNET was set up with funding from the Carnegie Corporation as a joint project of EDUCOM--a consortium of 500 colleges and universities--and the Massachusetts Institute of Technology to provide an inter-campus mail service for institutions using different messaging systems and protocols. The only agreed-upon standards between MAILNET sites are those involving acceptance and delivery of mail items. MAILNET users create, send, and receive MAILNET mail by means of their own local electronic mail systems. Twice a day or more, a relay computer at MIT places a call to the local system, collects and delivers MAILNET mail, and forwards the outgoing mail to the proper location. This network now links over 25 institutions, including four in Europe and two in Canada, and approximately a dozen different mail and operating systems. Through various gateways, access is available to several other networks such as ARPANET, BITNET, CSNET and JANET (the Joint Academic NETwork in Britain). Participating institutions are charged a one-time

implementation fee of $2,100 and a monthly service fee of $190. Usage charges are based on the actual number and length of messages sent each month.

## Networks in Canada

MLNET. MLNET is operated by the University of Western Ontario and was developed by Julian Davies. MLNET takes a similar approach to MAILNET, allowing users to format their messages on local systems before posting them to an out-mail box on the originator's machine. The central computer periodically picks up outgoing messages, translates them into the format of the receiver, and sends them over to the in-mail box of the receiver.

iNet. iNet 2000 is a service offered by Telecom Canada to allow subscribers easy and consistent access to a wide variety of some 225 databases. The system includes an integrated electronic messaging service with full text preparation, editing, and storage and retrieval features. The original purpose of iNet was to introduce an intelligent interface between a user terminal and its communication destination, relieving the user of the task of remembering and entering the many and diverse keystroke combinations for all the available networks and databases. Since the introduction of iNet in July 1982, however, several participants have withdrawn from the trial, including I.P. Sharp Associates, Info Globe, QL Systems, and Canada Systems Group Ltd. There has been some question of the need for such an added service with the rapid proliferation of microcomputer terminals and relatively sophisticated communications software that can carry out these same functions with little difficulty. Barbara Highland, General Manager of Info Globe, calls iNet a "disastrous flop." John Morris, a spokesperson for Telecom Canada, disagrees, claiming that iNet will have 1,500 customers, most of them commercial users, by the end of its trial in August 1985. John Halliwell, a Toronto based consultant and writer, sums it up:

> If a user has only a dumb terminal, then iNet, even with its faults, is an advance. But if he has a microcomputer, iNet is of little use. The iNet service, unfortunately, is yesterday's solution to today's communications problems—an attempt to do

with a big computer a task that is ideally suited to a microcomputer.

ENVOY 100. ENVOY 100 is a commercial electronic mail service offered by Telecom Canada. It is a star network in which the center, through which all messages are processed, is a central computer located in Ottawa. Customers use the DATAPAC network to reach the service. To send one kilopac of data between Ottawa and Vancouver using ENVOY would cost $112, whereas the basic DATAPAC cost would probably be under $3. The high costs of ENVOY 100 are augmented by the fact that the user has no way of compacting data so that a single packet is actually filled to its capacity of 256 characters. Whenever a "return" is entered from the terminal, a packet is dispatched by the ENVOY 100 system, regardless of how many or few characters it contains. This results in particularly high costs for large amounts of data.

In an effort to make its electronic mail service more attractive to users not located on the DATAPAC network, Bell Canada has applied to the CRTC for permission to make available an 800 number so that the DATAPAC network can be accessed free of charge from anywhere in Canada. It was the intention of Bell that this 800 access to DATAPAC would allow only specific use of the ENVOY 100 mail service rather than a general access to DATAPAC.

In an important move, TVOntario has submitted to the CRTC an addendum to this proposal requesting that Bell Canada provide a more general access to DATAPAC via the 800 service. If implemented, this national access to DATAPAC--from any location having a telephone--would open up TVOntario databases to many people currently outside the present DATAPAC service areas, including, for example, most of the French schools in Ontario. This would also eliminate long distances charges for DATAPAC connections to CoSy.

Canadian electronic mail services, other than ENVOY 100, include the Electronic Office Service (EOS) by CNCP and the privately-owned service, IMMEDIA. EOS charges $30 per month but IMMEDIA is generally the cheapest of the Canadian services. Micro users can prepare their messages before calling up this service, and reduce connect time to a minimum. Sign up at IMMEDIA costs $120 per organization but connect charges are a flat $15 per hour, while a line for the TELEX service, plus a machine, are $95 per month. IMMEDIA is the only service to make a connection to the relatively slow

and cumbersome TELEX service which, nevertheless, has about 1.5 million users world-wide.

Electronic mail services in the United States also offer rates substantially lower than TELEX but none has yet achieved as large a subscriber base as the 30 year old CNCP service.

NETNORTH. NETNORTH was developed at the University of Guelph and became operational in 1984. Under an agreement with IBM Canada, NETNORTH is now connected to BITNET in the U.S. and through this to various U.S. networks and the European Academic Research Network, EARN. IBM has provided Guelph with a computer to help coordinate the extension of the NETNORTH system to universities in Eastern and Western Canada. Like BITNET, NETNORTH uses a "store and forward" method of sending messages, passing data from one institution to another along the route. Member institutions pay a flat rate of $500 per month and are linked to an electronic web that stretches through Canada, across the United States, and over to Israel. Other countries linked by EARN and accessible through NETNORTH are Holland, Germany, Spain, Ireland, France, and England.

CDNNET. As networking technology evolved with different systems in different countries, a need emerged to establish global standards. In December 1983, the Comité Consultatif International de Télégraphique et Téléphonique (CCITT) produced the X.400 series of international standards for messaging systems, which are intended to influence the design of new messaging systems in all countries for the foreseeable future.

It has been suggested that future standards for computer conferencing may be developed out of the X.400 protocols for electronic messaging, and already electronic mail systems are being adjusted to achieve X.400 compatibility. GTE TELENET in the U.S. recently claimed to be the first with electronic mail software based on the X.400 standards, and as President J.T. Hann explains, "We intend to actively and aggressively promote the incorporation of the X.400 standard throughout the electronic-mail industry."

In 1981, the University of British Columbia received a $500,000 grant from the Natural Sciences and Engineering Research Council of Canada to develop a sophisticated nation-

wide communication network linking educational institutions. The communications software was called EAN. Because of close collaboration between the designer of this system, Gerald Neufeld, and members of the CCITT, EAN was completely X.400 compatible by January 1984 and soon became the world's first active implementation of these standards. EAN has now been installed in several colleges and universities across Canada as well as at TVOntario, and at research institutions in several countries in Europe, including England, Italy, Switzerland, West Germany, and Norway. The sites in Canada using EAN form the network CDNNET (Canada Net). Japan has implemented its own X.400-based system, developed by the government-regulated telephone company, Kokusai Denshin Denwa, which successfully communicated with the EAN software in January 1985.

EAN is a distributed message system; this means that each site runs the same software on its own computer rather than having a central computer that processes all information. This arrangement results in an "intelligent" network that automatically adjusts to different equipment and is able to route information between different networks. Because of its ability to pass easily through the various "gateways" linking the networks, CDNNET is sometimes referred to as a network of networks.

EAN has already demonstrated its ability to send complex NAPLPS files and very large software packages from Vancouver to Waterloo. In doing this, EAN compacts the data to make very efficient use of the packet switching networks and is therefore a much more cost efficient means of communication than, for example, Bell Canada's ENVOY 100 electronic mail system. A notable disadvantage to CDNNET at this time is the fact that the size and complexity of the EAN software restrict usage to computers such as the VAX and do not allow the user with a micro to join this network. However, work is proceeding at UBC to allow EAN to be run on a microcomputer such as an IBM PC. Nevertheless, CDNNET represents a state-of-the-art network and could provide a useful research tool and link to educational institutions across Canada.

## Educational Use of Canadian Networks

The task force on Technology and Research Communication of the Social Sciences and Humanities Research Council of Canada is studying NETNORTH and EAN, among other systems, and will

soon adopt some system to allow members of the various subcommittees to remain in touch between meetings. The purpose of the task force is to investigate what communication technologies and systems are available and to recommend which ones might be useful to institutes of higher education. The Canadian Higher Education Research Network has received a grant of $300,000 from the Secretary of State to establish a cross-Canada computer-based network of scholars and researchers to study higher education. The study group has decided to take advantage of existing technology for this project and is considering using NETNORTH, or CDNNET with EAN software, as these networks already link a number of educational institutions. They are also studying the feasibility of using a conferencing system such as CoSy. The details of this proposal are available in the Office of Development Research.

The Distance Education Committee of the Council of Ontario Universities has formed a technology subgroup to investigate the uses of technology in distance education. This group is considering forming or participating in a computer-based network. The group is evaluating NETNORTH and CDNNET, and is also exploring CoSy and the use of computer conferencing in conjuction with regular course delivery. As a test project, they are planning to offer a non-science course, such as Introductory Sociology, which will use computer conferencing as a course enhancement. This will be done at several different universities with distance learners, and there will also be a control group that receives the course without the computer enhancement.

## The Future

Home networking may be defined as the integration of the home into a network of computer-based communications, emanating primarily from the corporate sector and effected through the introduction of interactive videotex into the home (Wilson 1984). The use and meaning of the term "videotex" has evolved considerably in recent years as have the technologies with which it was formerly associated. Videotex is now used as a generic term to refer to all two-way interactive information delivery systems, which may or may not use NAPLPS graphics. In addition, videotex services are moving away from a dedicated terminal that can only access one videotex source, and are catering to the growing number of multi-use personal computers. It has now been shown that although the videotex trials so far produce enthusiastic responses,

consumers are generally reluctant to pay what it costs to deliver the various services into the home at this time.

However, in spite of the trend in North America for videotex services to fall far short of earlier predictions of success, according to Haines Gaffner of LINK Resources, the electronic services industry is, nevertheless, "destined to become a 100 billion dollar industry by 1995, making it the eleventh largest in the United States." That view appears to be shared by some of the largest corporations in the U.S. that are preparing to make major investments in this business without any expectations of profit for the next few years. According to Martin Lane, also of LINK Resources, this is because the "heel of the curve," or critical mass of users necessary to produce general acceptance of this service, will not occur for several years. By then the price of modems and NAPLPS decoders will have come down and new generations of microcomputers will probably be sold with these devices built in, along with the capability to display the appropriate range and mix of colors for NAPLPS graphics. At the same time, according to a recent LINK study, there is a perceptible trend for the home user away from low-end micros towards these mid-range and high-end units with correspondingly more features and capabilities. As the consumer base expands, advertising will become more common, helping to further defray costs to the user. The range of services and information, such as shopping, banking, travel information, library access, journals, electronic mail, computer conferencing, and university courses, will expand and the home user will be tied into a series of large, interactive, versatile, computer-based networks. This will have a significant impact in the areas of education, marketing, and publishing, or in more general terms, the control and distribution of the commodity of information (Gaffner, 1985).

By the time this happens, the giant multinational conglomerates now being assembled--such as Sears, CBS, and IBM, which have combined in a company called Trintex--are hoping to have pooled their considerable resources and established themselves securely in this arena that is regarded as strictly a research and development game for the next several years (Gaffner, 1985).

Although commercial systems, with their interest in products having mass market appeal, tend to have limited interest in educational materials, there may be a high level of compatibility between education and videotex. A report to

the Corporation for Public Broadcasting on educational videotex projects at San Diego State University and the University of Nebraska-Lincoln states that "Both of these projects have clearly demonstrated that the interactive capability of videotex is ideal for the delivery of instruction" (KUON-TV, 1984). This growth of larger national networks, increasing use and acceptance of home computers and home networking, along with a growing trend toward home-based learning, could provide excellent new opportunities for educational information providers who have experience in the field of innovative interactive programing.

## APPENDIX B: INTERACTIVE CABLE

### Introduction

By installing a computer at the source and by inserting a black box--with various capabilities--between the cable and a television set, it is possible to use an existing cable TV network to send information in two directions. This has caused several cable companies to offer a range of interactive services to their customers in an attempt to entice the consumer to pay extra money for the use of these videotex or "cabletext" services. "Cabletext" is identical to the teletext service, which transmits a continuous cycle of "pages" to the viewer, except that cabletext is transmitted over a cable system rather than broadcast. Although a user of teletext or cabletext may affect the information displayed on the screen, the source computer transmitting the data is unaffected by these choices. Such a system is often called "one-way interactive." A system that does allow the user to interact with the source computer would then be called "two-way interactive."

In recent years there has been considerable interest in the commercial possibilities of interactive cable television, and several trials have been conducted, though with little success. An ambitious project was developed in Columbus, Ohio, by Warner Amex, a subsidiary of Warner Communications and owner of 13 cable TV systems across the United States. The Columbus project was thought to be an accurate barometer for consumer attitudes toward new goods and services. The viewer was supplied with a two-part computer terminal: one part, a small black box, remained near the TV while the other, a device like a large calculator called the Qube console, was connected to the TV by a long wire. Using the Qube console, the subscriber could select channels and "talk back" to the broadcaster regarding program selections. Four years in the planning, the project began in the winter of 1978 with a base of 26,000 subscribers and plans to expand to 100,000. Consumers did not share Warner's enthusiasm and did not sign up as predicted, with the result that by the end of 1984 the project had been completely abandoned.

In 1983, the public broadcasting station at the University of Nebraska-Lincoln, KUON-TV, with its Division of Continuing Studies, and San Diego State University's public television station, KPBS, were awarded a $125,000 grant from the

Corporation for Public Broadcasting to study interactive cable and develop applications for instructional purposes. The project was developed in cooperation with Cox Cable of Atlanta, which provided educational programming and services on INDEX, an advanced interactive cable service. Once again the programming and service content failed to catch the imagination and financial support of the public. According to Scott Leigh of KUON-TV, the INDEX project has now been "buried" and Cox has withdrawn from the whole videotex market.

## Interactive Cable in Canada

Rogers Cable. In Canada, Rogers Cable systems, one of the world's largest cable television companies, operated a pilot project for two-way cable in London, Ontario. Viewers were able to "vote" for different choices during talk shows and indicate preferences for suggested programming. Again, the services were not seen by the viewers as being useful enough to pay for. According to George Alorabondi, director of Rogers' two-way services, this system is now dormant and there seems to be little incentive for Rogers to implement interactive cable in Canada. Alorabondi cited restrictive CRTC regulations as being an initial obstacle, although he says that CRTC officials are now being more receptive. (Rogers has two-way systems operating in Minneapolis, Portland, and San Antonio, with subscribers of 32,000, 40,000, and 25,000, respectively. Only the high-level cable subscriber who selects all the options gets the minimally interactive equipment, which costs approximately $10 or $12 per month plus an "event" charge of $3 to $5 for a movie. Viewers can "vote" from a list of movies to select which one to see at 9:00, for example, and which at 11:00.)

Videotron. Despite these early failures, Videotron Cablevision in Montreal, the second largest cable company in Canada, is undertaking a bold and ambitious project to deliver an eventual videotex service to some of their 600,000 subscribers. The first stage, to begin in the Fall of 1985, will be a strictly "one-way interactive" cabletext service transmitting a cycle of 20,000 possible pages. This text will contain categories of general information, education, entertainment, community affairs, and local events, with a concentration on delivery in French.

Using a sophisticated black box with 64k of internal memory, the subscriber will be able to select items of interest with the aid of a keypad supplied by the company, or to capture software, such as videogames, to be run on the black box. There is no permanent storage capability planned for the user at this stage, however, so all information is lost when the system is switched off. In addition, the actions of the user have no affect on the source computer--as in a two-way interactive system--since he or she is merely making selections from a continously transmitted cycle of pages.

In the second phase of the program, not expected before 1987, the Videotron system would become a fully two-way interactive videotex service. The black box would be equipped with an RS-232 port to allow connection to a microcomputer, and the user would have access to all the videotex services such as home banking, shopping, and reservations. The black box is built by Videoway Limited in Montreal; their initial contract from Videotron, according to Steve Candib, calls for 100,000 units. Billing procedures for this service are still under discussion, but Videotron will be attempting to do what no other North American company has yet accomplished successfully: to market a video service with content that subscribers are prepared to pay for at a price that will also provide a profit for the supplier. And this service will be using a cable technology that has generally been rejected in favor of the telephone system by most videotex providers. In expressing concern over the project, Barry Gage, president of Maclean Hunter Cable Systems, suggested that Videotron will likely be "big winners or big losers."

## The Future

In spite of the fact that interactive cable may be a two-way interactive technology, most existing systems provide only limited interactivity, and this technology has so far failed to capture the financial support or the imagination of the general public. Videotex operators point to the geographical limitations of a particular cable TV network which would restrict the potential market for their services. In any case, the cable operators have not shown much inclination to make their networks available to outside operators. In addition, it is more convenient for home computer owners to use their micros and a modem as the basis for a system to access videotex services, rather than purchasing additional dedicated hardware and signing up with a cable company to access the videotex or cabletex services using their

television sets. Television receivers are also becoming interactive terminals--Quasar and other manufacturers include microchips and NAPLPS decoders in their latest models.

While it is true that at present, cable is better suited to high speed transmission than the telephone system, use of the telephone system becomes increasingly attractive as the cost of high speed modem decreases and the graphics capabilities of personal computers improves. It is likely that new generations of home computers will come equipped with modems, NAPLPS decoding, and color capability.

In addition, there is a bold plan to make major changes to the world telecommunications systems. The problem, at present, is that on a map of available communications networks, the telephone lines may be thought of as the dirt roads of the the highway system. Designed in the days before computers and modems, the telephone lines are now creating bottlenecks in the high speed flow of information. Signals travelling along the twisted pair of copper wires tend to fade and lose definition quite quickly, and the current rate of transmission of the signal in an analog form is relatively slow. The ideal solution of replacing all the old wires of the telephone system with fibre optic cable would be very expensive and is unlikely to occur in the near future. However, a new technology known as integrated services digital network, or ISDN, will use existing telephone wires to transmit data directly in digital form. ISDN will eliminate the need for modems and will operate at 15 times the speed of the fastest modems now available. Devices will be installed at the user end of the line to perform rapid calculations on the incoming data and to reconstruct the original signal. Each pair of wires will be able to carry two separate voice calls at one time, as well as large volumes of data.

Numerous telephone companies are working on ISDN systems and some, such as Pacific Bell, Illinois Bell, and Southern Bell, have already announced high speed digital systems, operating at up to 56 kbps (the equivalent to 56,000 baud). Vice-President of Market Development for Northern Telecom, David S. Rendall, announced in a "Network Planning Letter" in February 1985, that "Northern Telecom is dedicated to the development of products for ISDN." The 1985 United States Telephone Association (UDTA) Showcase carried the theme that ISDN is not an end but just the beginning of bigger things to come.

While these technologies are not yet in general usage, the telephone system seems likely to be the preferred medium for interactive communications in the future. With the exception of the Videotron experiment, it appears that most videotex services are electing to target the microcomputer user through the use of the telephone system, while the cable companies, already involved in a volatile market, are retreating from implementation of expensive and as yet unproved two-way equipment and services.

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